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Short Communication

Root canal therapy for the first permanent three-rooted (Radix Entomolaris) mandibular molar with acute irreversible pulpitis: 12-month follow-up case report

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ABSTRACT

Root canal architecture is complex; hence, understanding any deviation from the norm is essential to achieving the best possible treatment result. Mandibular molars are typically double-rooted with one or two distal and two mesial canals. Nonetheless, the majority of anatomical abnormalities in terms of root number and form, as well as canal count, are seen in mandibular first molars. The presence of a third root, either buccal or lingual, in addition to the two already present, is one of the morphological variations that exist. The distolingual location of a supernumerary root is the defining feature of radix entomolaris (RE). A deep and passionate perception of root and root canal architecture and configurations is necessary to diagnose, identify, and treat these abnormalities, all of which can improve results. The endodontic management of a permanent mandibular first molar with a RE is covered in this case report. An explanation of the frequency, external morphological variations, and internal anatomy of the RE is presented.

Keywords: Anatomical variation, distolingual root, radix entomolaris, root canal system, mandibular first molars with three roots.

1-Introduction

A root canal's success depends on the patient's awareness, understanding, and meticulous cleaning and shaping of each root canal a priori to the root canal filling.[1] Carabelli originally described radix entomolaris (RE), one of the permanent mandibular molar's alterations, in 1844.[1,2] It is distinguished by the additional third root that is distolingually located. The first, second, and third mandibular molars may all have RE, with the second molar having the lowest frequency of the condition.[3] RE is far more common in Asian populations, where the incidence reaches 20%, whereas it is only approximately 3% in African and 0.7% to 3.4% in European cultures.[4]

Special attention should be given to the three rooted mandibular first molars since their structure differs from the other two roots' in size, shape, and occasionally both. Using radiographs, the initial diagnosis of these variations is frequently made. Successful endodontic treatment greatly depends on radiographic diagnosis, which, when obtained at various angulations, provides information about additional canals or roots and helps to understand better the anatomy of the root canal system and the treatment strategy with the necessary expertise and complete clinical thoroughness for a successful root canal treatment procedure. [5]

This case report covered the diagnosis and effective root canal treatment of a mandibular first permanent molar with an RE.

2. Experimental

A 24-year-old female was referred to the Endodontic department clinic with a chief complaint of acute pain in the area of her lower right back tooth that had persisted since the previous week. The patient disclosed a one-month history of mild intermittent pain that had become more intense in the previous week. The patient complained of ongoing hot and cold sensitivity. The pain was spontaneous and flared up out of the blue, especially at night.

Clinical examination of the right mandibular first molar revealed deep occlusal carious lesions. Percussion did not cause any tenderness in tooth 46. Regarding tooth 46, the preoperative radiograph showed a radiolucent carious lesion that involves the pulp with respect to 46. Moreover, the radiograph revealed the existence of a second distal root outline [Figure 1]. Considering the clinical and radiographic findings, 46 was diagnosed as symptomatic irreversible

pulpitis. It was recommended that the patient undergo root canal treatment, and endodontic therapy was commenced after receiving informed consent.

For anaesthetising tooth 46, 1.8 ml 4% articaine 1:100000 epinephrine was used. Rubber dam isolation was carried out following caries excavation. Using a rubber dam, the tooth was isolated, and a dental operating microscope was used to prepare the cavity under magnification. Upon examining the floor of the pulp chamber with the aid of a DG 16 endodontic explorer, three canals were identified: the distal, mesiolingual, and mesiobuccal. On the other hand, the distal canal was situated closer to the buccal side, suggesting another canal was present on the lingual side. Using a DG 16 endodontic explorer, further investigation of the pulpal floor was conducted for localization of a second distal canal. The second distal orifice was revealed by a catch distolingually, and the distolingual canal was included in the modified trapezoidal-shaped access cavity, which had previously been triangular in shape [Figure 1]. K-files of the #10 size were used to negotiate canals. An electronic apex locator was used to calculate the canals' working length. Cleaning and shaping were performed using the crown-down method and rotary NiTi (M pro gold and Edge). In order to eliminate the smear layer, the canals were irrigated with a 2.5% sodium hypochlorite solution, flushed with a 17% EDTA solution, then activated with XP Finisher. Size 40, 35 (4%) gutta-percha was used, a master cone radiograph was taken, and tugback was confirmed for the cone fit [Figure 2]. Paper points were used to dry the canals, then AD Seal and the cold lateral compaction technique were used to complete the obturation process. A final radiograph was conducted to assess the quality of the obturation after the access cavity was rebuilt using glass ionomer [Figure 3]. For the final restoration, the patient was referred to the operative department.

One year post-operatively, the patient was recalled for both clinical and radiographic follow-ups. The patient presented with no clinical signs or symptoms. There was no development of any periapical lesions or any signs of infection appeared in the periapical radiograph [Figure 4].

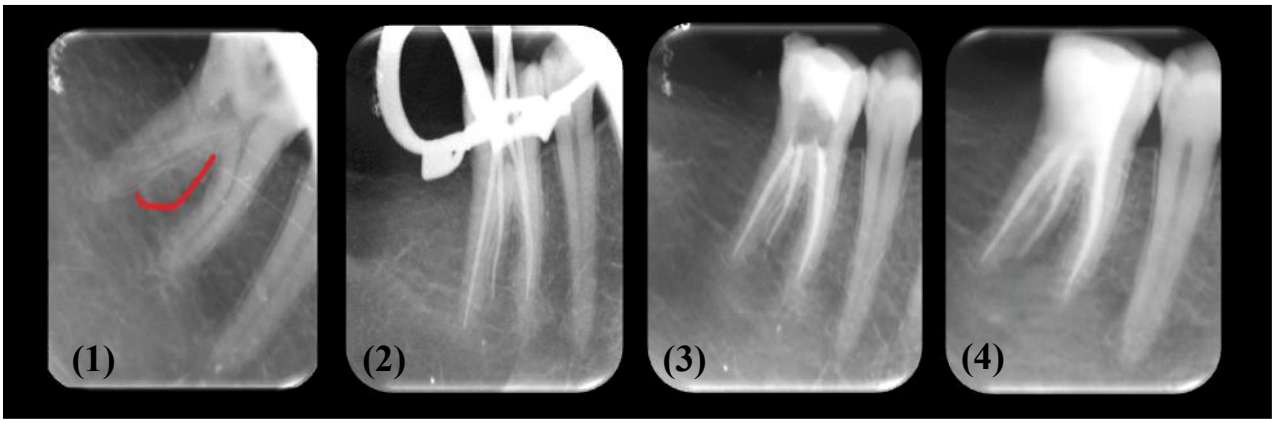

Figure (1) Preoperative radiograph of tooth 46

(2) Master cone radiograph of tooth 46

(3) Postoperative radiograph of tooth 46

(4) 1y followup radiograph of tooth 46

3-Results and Discussion

Usually, a solid awareness of both internal and external anatomy, a correct diagnosis, and proper root canal cleaning and shaping lead to a favourable outcome. Clinical inspection of the tooth crown and study of the cervical morphology of the roots via periodontal probing can both reveal the presence of an additional root. A more prominent occlusal distal or distolingual lobe in conjunction with a cervical prominence or convexity, or an extra cusp (tuberculum paramolare), may be signs of RE.[6]

Since the buccolingual plane is home to both the distobuccal root and RE, superimposition of both roots on the preoperative radiograph may lead to an inaccurate diagnosis. When detecting RE, a mesial angled radiograph is claimed to be superior to a distal angled radiograph with radiographic angulation of 25–30°. If the presence of RE is difficult to detect on a standard radiograph, CBCT can be useful in order to prevent potential iatrogenic events due to canal curvature, as it enables the precise identification, position, curvature, and angulation of the RE.[4] RE's orifice may be positioned distolingually to mesiolingually from the main canal or canals; locating RE's orifice is facilitated by extending the triangular access cavity more distolingually, which results in an outline form with a trapezium or rectangle shape. Furthermore, the position of an RE canal orifice can be seen visually by using a black line placed on the pulp chamber

floor as a guide. This method can produce a trustworthy and dependable diagnosis in most circumstances.[7]

Classification:

RE was categorised into four categories by *Carlsen and Alexandersen* (1990)[8] according to the cervical part location:

Type A: Lingual to the distally located root, RE exists.

Type B is Lingual to a distally located root with one cone-shaped macrostructure, RE exists.

Type C: Lingual to the mesially located root, RE exists.

Type AC: Lingual between the mesially and distally located roots, RE exists.

Also, RE was categorized by *De Moor et al.* (2004)[9] according to the root canal's or the root's curvature:

Type 1: The root canals or roots are straight.

Type 2: The coronal third is curved and then looks more straight in the apical and middle third.

Type 3: The coronal third has an initial curve and then a second buccal curve that starts in the apical or middle third.

Additionally, *Song et al.* (2010)[10] introduced another two recently acquainted variations of RE:

Small form: Its length is half of that of the distobuccal root.

Conical form: Smaller than the small form and devoid of an internal root canal.

Wang et al.[11] radiographically categorized RE into the following categories according to the extent to which the DL and DB roots overlap:

Type I: An image with slight overlap.

Type II: An image with moderate overlap.

Type III: An image with severe overlap.

Because of RE complicated and changeable anatomy can result in severe endodontic difficulties like instrument separation, loss of working length, ledge formation, root canal transportation, root weakening, vertical root fracture, and furcation or strip perforation. Coronal

preflaring, canal cleaning and shaping, and post-space preparation are the times when these problems are most prone to occur. In order to minimize these complications, straight-line access should be achieved and prevention of perforations can be achieved by first lingually moving the orifice without removing significant amounts of dentin. Straight line access and prevention of perforations are facilitated by the first transfer of the orifice lingually without requiring a lot of dentin to be removed. It is recommended to use manual stainless steel files for preflaring in order to avoid instrument separation because the probability of instrument fracture rises noticeably with decreasing radius of curvature. Ledging and transportation mistakes would be decreased by using files with smaller sizes (less than or equal to size 10) for the initial canals exploration, creating a glidepath, and accurately determining the canal curvature and working length. Lastly, it is claimed that using crown-down technique with rotary nickel-titanium files with a taper not exceeding 4% which permits the preparation of the canal to be more conservative, rounder, and centered than when utilizing stainless steel instruments.[12]

In the present case report, conventional methods were used to locate and identify the canal orifices, including conventional periapical radiographs, the DG-16 endodontic explorer, and an understanding of the roots and root canal architecture. The straight root and root canal of the RE were discovered, which was categorized as De Moors Classification Type I. According to Wang's classification, radiographically, there was slight overlapping between DL and DB root, so it was categorized to be type I, which was successfully managed.

4. Conclusion

A RE requires a cautious and customised radiographic approach in addition to a clinical one; failing to do so could result in procedural errors and a treatment outcome that is not successful in the future. Understanding the frequency, diagnosis, morphology, canal layout, and appropriate clinical management of radix entomolaris (RE) in conjunction with angulated radiographs is a crucial prerequisite for a successful endodontic treatment.

- **Conflict of Interest**

The author declares no conflict of interest.

5. References

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